Introduction to R Software
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Lecture – 16
Repeats

Welcome to the next lecture on the course introduction to R software. In the earlier lecture, we discussed about the command sequence and we learned how to generate different types of data sets using the sequence command. Now following the same idea; now we are going to discuss another command which helps us in the data generating process and this is repetition whenever you are trying to do a programming many times; it is required that we need to generate the data repeatedly. For example, any numbers or any sequence this has to be repeated a certain number of times.

One option is that you can just enter all the data manually; for example, 1, 1, 1, 2, 2, 2 and so on and use the combined vector to represent the data another simple option is that we can use the repeat command and using that we can a specify the data once or a command once and the same command or the data can be repeated for certain number of times depending on the objective of the study. So, let us try to understand how to use this repeat command in R software.

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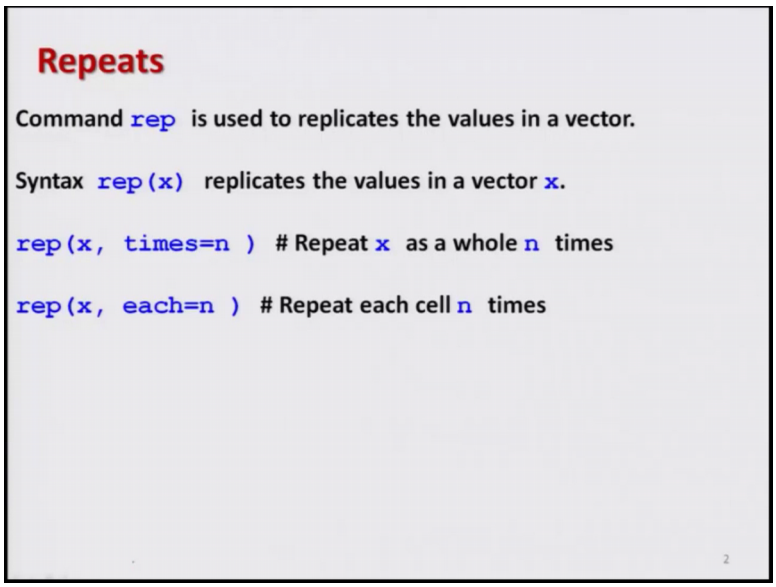

In order to repeat a set of values or a set of data or a vector or certain values inside a vector, we use the command rep. This is a short form of repeats and the syntax for repeat is rep and inside the bracket, we have to give the either a variable or the data what we want to replicate for example, when I try to write rep and inside the bracket, I write the variable x and suppose x is a vector quantity then replicate x or say rep x will replicate the values in the vector x another option is that I can use here rep x to replicate the values in x and I specify here times equal to n and this is separated by a comma this means that repeat the values inside the x for the n number of times and remember one thing n is going to be here an integer because the repetition can be done once twice thrice and so on.

Similarly, another command is that I can use here rep x and followed by e a c h; each equal to n and this is separated by this comma this means I want to repeat each of the cell in the vector x a small n number of times. So, using these commands we try to generate the data. So, where us try to take several example and we try to understand how this rep command works well the first thing comes that.

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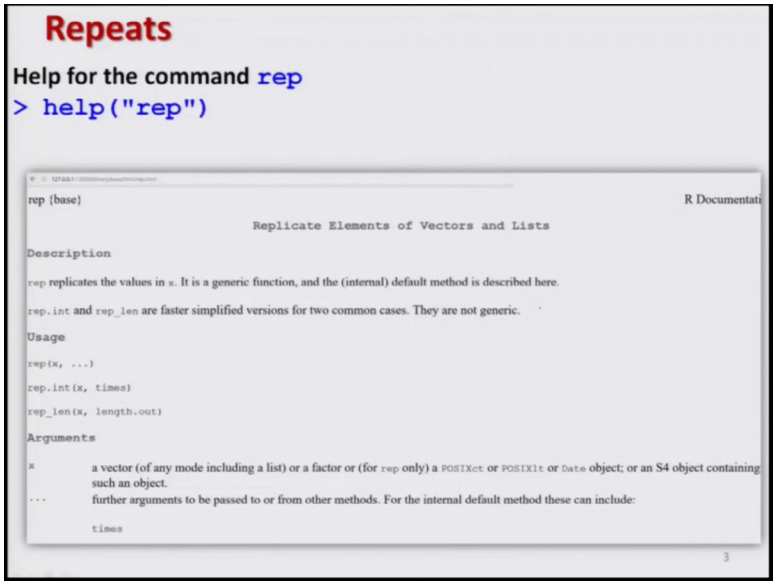

How to take help; this is very simple as usual you simply have to use the help command help and inside the double quotes just try to write rep and let us try to see what do we get although here I have given a screenshot of the site, but a still we want to know what happens.

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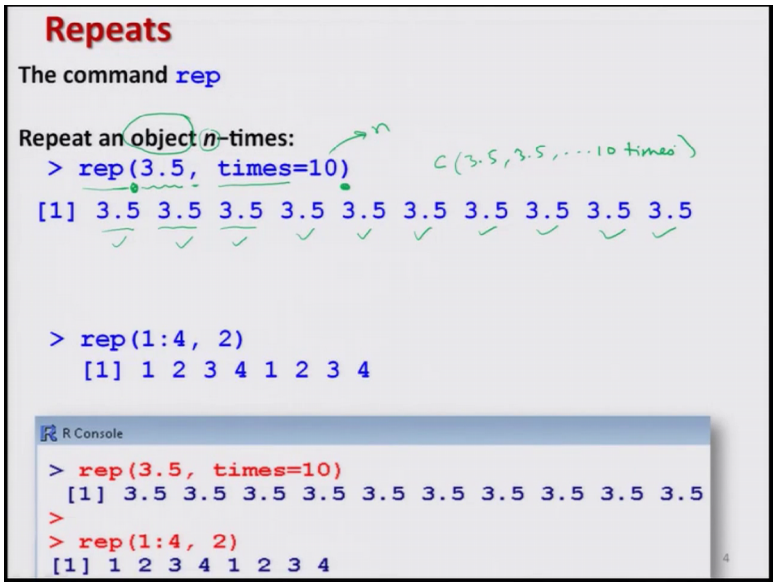

So, you can see here as soon as you give here help rep this commands bring you on the help provided by the R software site and the questions here about the rep and this here this is here what they are trying to mention base; that means, this package or this function is included in the base package of R and here you can see they have give they have given all sorts of detail over here, right. So, what I would request you that you please try to understand and read from these details; they will give you the most authentic information on the help and usage of this R command.

And if you try to read it you will see that they have given all sorts of possibilities here in this course it is really not possible to include all sorts of possibilities, but as I said earlier several times that my idea is to help you to a start with the learning of R, right that you can see here, they have given several examples also means what else you can expect as a help. So, now, we try to understand through different example that how this rep command can be used, right.

The first thing which I want to do is that I want to repeat an object is small n number of times; how to get it done; I am trying to simply take a scalar value single value; either can be a integer or a fraction whatever you want and I try to take here rep and inside these 2 bracket; I try to write down here the value which I want to repeat I have taken it to be here 3.5 and comma and then I try to write down here times equal to 10; that

means, I want to inform the R that how many times this value 3.5 has to be repeated and times is a reserved word. So, times equal to say n and here n is equal to here ten.

So, this is the value of here n so; that means, I want to repeat the 3.5 value 10 times and as soon as you enter, you get here 3.5, 3.5, 3.5 and this is recorded receivable how many times 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. So, you can see here that that 3.5 values is the repeated 10 times another option is this; I can define here a vector in which I try to give 3.5; 3.5 say up to 10 times which is a tedious job and rep command will help us in doing.

Now I try to take here another example and I try to see that a sequence can also be repeated. So, here I am trying to take an example where sequence is repeated. So, let us try to take a sequence 1, 2, 3 and here 4 and because we have now understood that this can be generated by the command one colon four. So, now, I try to repeat this thing say r e p; rep and here I am trying to give inside the brackets say one colon four; that means, us generation of a sequence of 4 values is starting from one to 4 and this I am saying that this is giving me the number of times.

So, this sequence I am asking to repeat 2 times. So, as soon as you enter here you will get here a sequence of 1, 2, 3 4 here and next this sequence is repeated again 1, 2, 3 and 4. So, you can see here that the entire sequence is repeated here 2 times and here is the screenshot, but we will also try to see; how do we get it on the R console.

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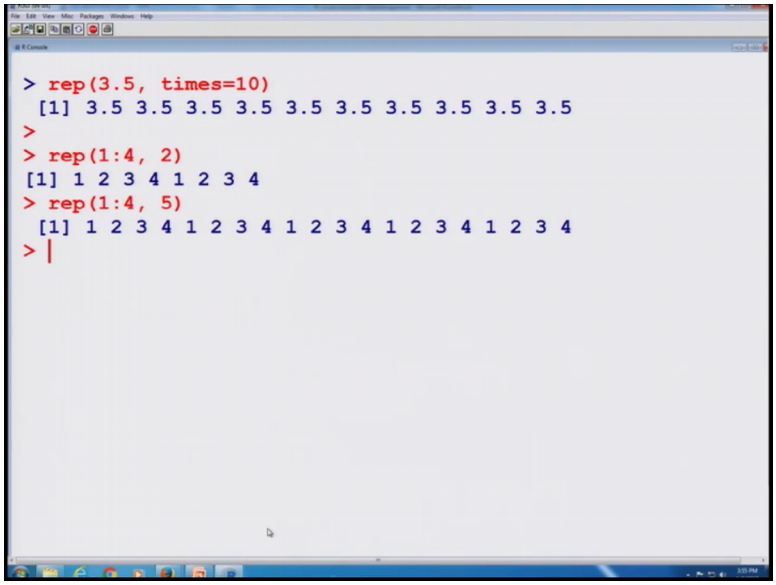

You can see here that this 3.5 value has been repeated 10 times and similarly if I try to write down here rep 1, 2, 4 and suppose if I 2 times you can see here this is repeated 2 time.

And similarly if I want to repeat it for some example here 5 times; you can see here that the sequence has been repeated 5 times. So, you can see that either, it is a scalar or a sequence that can be repeated and the required data can be generated. So, let us now come back to over slide and then let us try to see what more examples are there, right.

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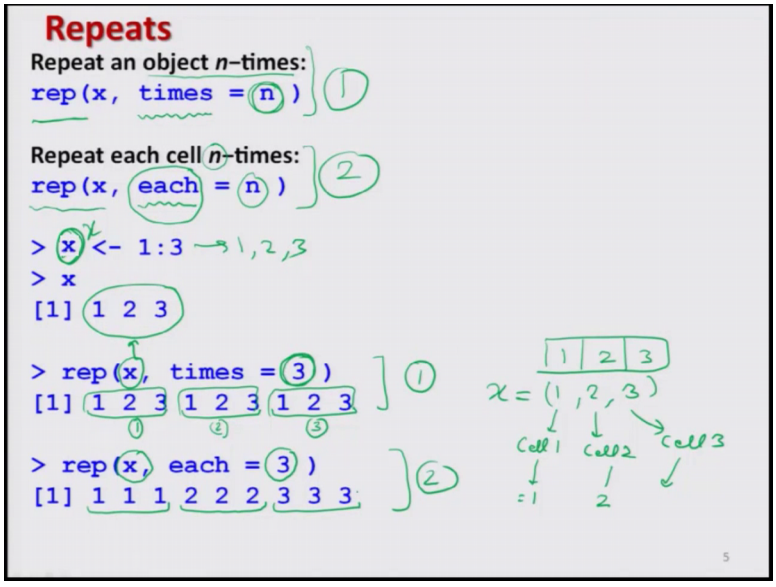

So, now, there is another option inside this rep command; I am trying to use here; 2 option; one is here times and another is here each and rest of the command remains the same that is rep inside the bracket it is x comma and them either times or each.

And let us try to see what happens with these 2 commands. So, in this case, what I am trying to do I am trying to repeat an object n times and what is my object this is a x this can be a scalar or this can be a vector quantity for example, earlier we have considered an example where I have where I have taken a sequence from 1 to 4. So, in this case, the every object is repeated is small n number of times and n has to be an integer value.

And in this case when I am using the repeat command with here each it is saying that repeat each cell is small n number of times; what does this mean? Let us try to understand by this simple example that here I am trying to define here a variable here say

here x which is a sequence here 1, 2, 3; so that you can see where the cases the outcome, right. Now I try to use the 2 command let us call it say this is command number 1 and this is here command number 2.

So, when I try to use here; here the command number one here you have to notice that here this x is containing these 3 values 1, 2, 3 and what I am asking that please repeat x 3 times. So, you can see here 1, 2, 3, 1, 2, 3 and 1, 2, 3 this is the outcome. So, this is repeated one times; this is repeated second time and this is repeated here third time. So, you can see here the entire sequence is repeated the sequence 1, 2, 3 is repeated 3 times.

Now, I try to use the second command which is here each you can see now here that in this vector here x 1, 2 and 3; there are 3 cells; cell number 1, cell number 2 and this is my here cell number 3; why do we call it here cell because it looks something like this there are 3 cells 1, 2 and 3 and each number is assigned to a particular address in the cell. So, now, I am saying that here that please repeat every cell contained in the x 3 times.

So, now the control first come to the cell number one which is taking here the value here one and the increase in the cell one are repeated 3 times then the control comes to the another address in the cell that is cell number 2 and cell number 2 has a value 2 then this 2 is repeated 3 times then the control comes over the cell number 3 and the entry in the cell number 3 is repeated 3 times.

So, this is the basic difference between the use of times and each inside the rep command and tries to do it over the R console also x equal to 1, 2, 3.

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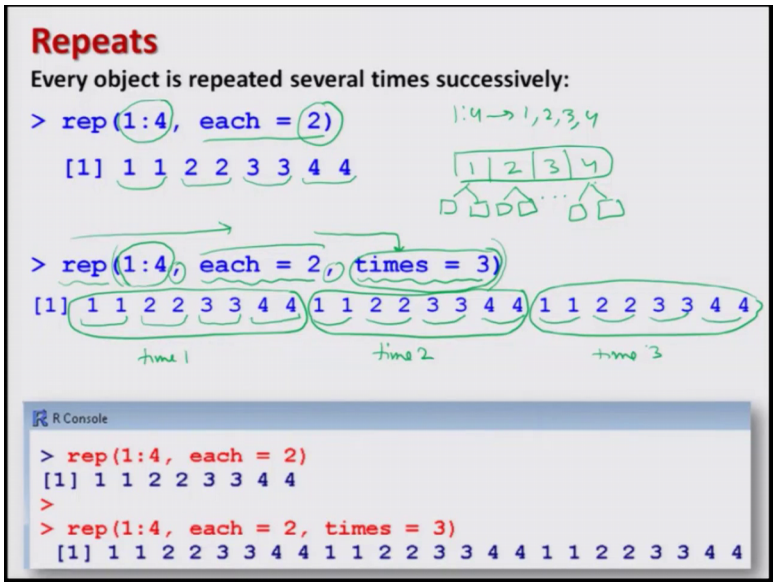

So, x here takes here value 1, 2, 3 and then this command. So, this gives here; the same command same value which is contained here.

Now, I try to take the other command and let us try to see what we get here this is here 3. So, now, you can see here one is repeated 3 times 2 is repeated 3 times and 3 is repeated 3 times, right. So, let us now come back to a slide now another example you can see here that I am trying to take here a sequence here and a sequence is repeated using each end times options.

So, I try to take here a sequence of here 1, 2, 3 and 4. So, this 1, 2, 3 and 4; this is specified by one colon four. So, now, I am saying that here each equal to two; that means, each of the values in this sequence 1, 2, 3 and 4; this has to be repeated 2 times another example of on the same line. So, you can see here one is repeated 2 times 2 is repeated 2 times 3 is repeated 2 times and 4 is repeated 2 times and this is the same thing here that I have got here say here 4 cells every cell is containing the value 1, 2, 3 and 4.

So, this is repeated 2 times, this is repeated 2 times, this is repeated 2 time, this is repeated 2 times and so on; this is repeated 2 times and this is repeated 2 times, right. Now I try to take care another example in which I am trying to use the 2 options each and times together. So, I try to generate here a sequence of values 1, 2, 3, 4 and using the rep command over here I can specify all the options within the bracket sign this bracket and this bracket and the options are given separated by this commas.

So, first I am trying to write down here each equal to 2 and then I am writing times equal to 3 this means here what the operation goes from left to right first of all the sequence 1, 2, 3 4 is generated and then I am asking each equal to two; that means, every cell in the sequence one 2 4 is being repeated 2 times. So, this is here 1, 1, 2, 2, 3, 3 and 4, 4.

Now, in the next step I am asking here to repeat the entire sequence whatever is being generated up to the option each equal to 2 3 times. So, you can see here if I call this set of values is my time 1, then this is my another set of value 1 repeated 2 times 2, repeated 2 times 3, repeated 2 times 4, repeated 2 times and this entire set is repeated again and this is here my time 2 and the same process is repeated here 1, 2 times 2, 2 times 3, 2 times 4, 2 times and this entire set of values is also repeated third time.

So, this is equal to time equal to 3 this is how you can see this repetition; this is how you can see that the repeat command can be used to generate different types of data sets now let us try to do it over the R and see what do we get over here.

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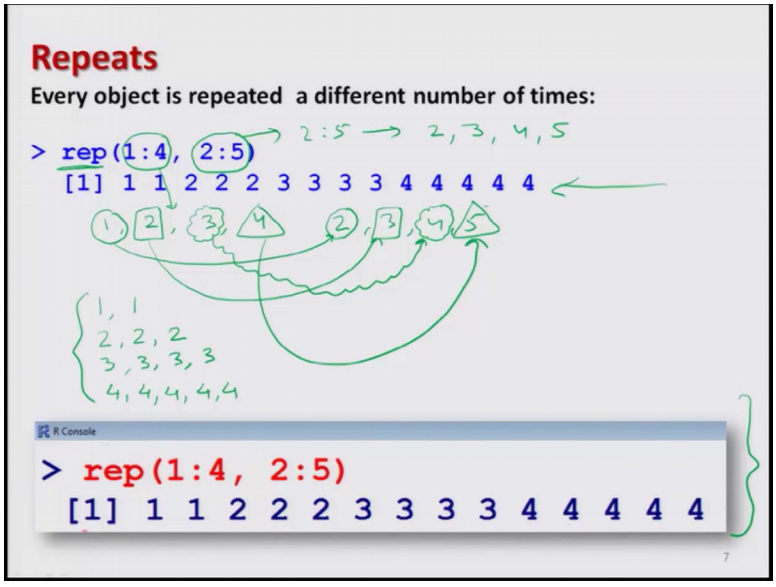

You can see here; this is the same output that we have got and similarly if I try to use here the each and times command both together then you can see here that I am getting here the same thing a sequence of 1 to 4 is repeated 2 times from here first set, then second set and then the third set, right.

So, this is how we try to get over here and the screenshot is also given over here right now we come to another aspect up to now; what we have done that every object has been repeated an equal number of times, but suppose we have a situation where I want to repeat a particular object either a scalar or a sequence or a vector say different number of times then how to get it done.

So, I try to use here the rep command and I try to generate the same sequence one 2 here 4 and now I am saying it repeat it using this command which is here 2 to 5 which is giving me a vector here 2 colon 5 as 2, 3, 4 and 5 . So, now, if you try to see what I am trying to do here that in the first a step, I am trying to generate here a vector of values 1, 2, 3 and 4 this is here.

And now I am saying that these values have to be repeated say 2, 3, 4 and 5 times and these values are controlled by another vector now how the operations are done first of all the control comes over the first value and it sees what is the number of time; this value has to be repeated and it says here one has to repeat it 2 times.

So, it will repeat here one and here one. Now the control comes over here and it comes to the second vector come to the second value; in the vector which is here 3 and it says that the value 2 has to be repeated 3 times and it repeats the 2 value 3 times then this options comes over here 3 and then it comes to the third place in the another vector 2 to 5 and it observed that this value here is 4.

So; that means, it says that 3 has to be repeated 4 times and finally, the control comes over here on the value 4 and then it comes to the fourth value in say another vector this is again here 5 and this is that the value 4 has to be repeated 5 times and we get this type of data here in this outcome and this is the screenshot which we obtain, but us also try to do it on the R console also.

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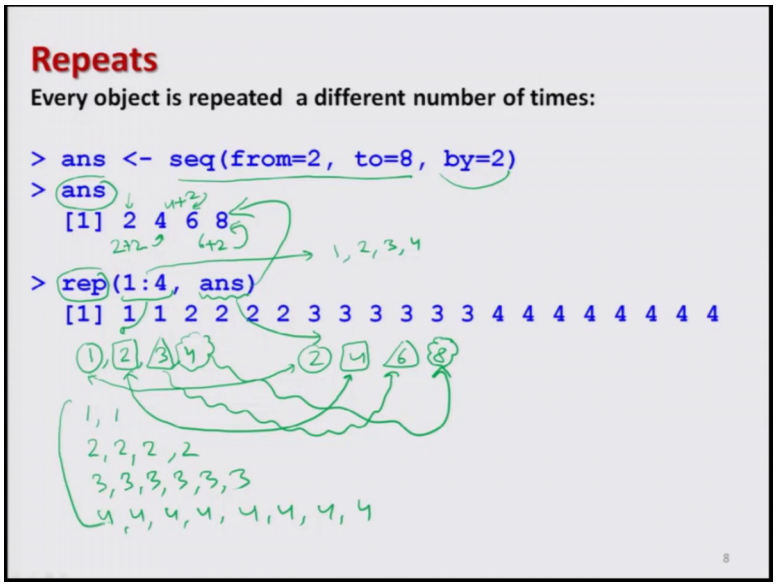

So, you can see here that the same thing is happening means if you want to say repeat here for this for some different number of you can say time let us try to see suppose I make it a 2 equal to 6; what does this give this is giving that the query some problem now can you diagnose what is the problem the problem is that that the number of values in this sequence and the number of values in this sequence are not the same.

So, one rule what we have now understand here is that that the number of values in both the vectors should be the same right and if you try to look it from this slide also this is also clear means if I try to suppose add here some value here see here say six, but then there is no value here which can map from here to here that is why there is a problem in the sequence.

So, now the rule what we have understood is that whenever you are using such type of command the elements in the 2 sequences here and here they should always be the same otherwise you will always into an error argument right what is now to try to take another example well the example is the same, but I am trying to present it in a different way which is more useful whenever you are trying to do a programming.

Suppose I try to generate a sequence from 2 to 8 and I want this to be increased by 2 units that mean the increment is 2 units. So, the control will start from here 2 then 2 plus 2 this will give me here 4, then 4 plus 2 this will give me here 6 and then 6 plus 2 this

will give me here 8. So, I get here a sequence 2 4 6 8 which I have a stored in the variable here say ans which is short form of answer.

Now, I am using the rep command and I am here generating a sequence of here one 2 four. So, I have in this part; I am trying to generate this value 1, 2, 4 and then I am trying to say that please try to repeat it and the control is given by the vector ans which we have obtained earlier here. So, now, if you try to see what will happen this one 2 4 this will generate a vector 1, 2, 3 and here 4 and this ans vector; this will generate the values 2 4 6 and here 8.

So, the same process happens once again that this part this address at this address that is the first addresses or both the vectors are matched and it is saying that the value one has to be repeated 2 times then in the second stage; these 2 addresses are matched together and this says that 2 has to be repeated 4 times then in the third stage the third addresses are matched together and then we get here 3 6 times and similarly here in the fourth option this fourth is matched with the fourth position in the another vector second vector and that is 8.

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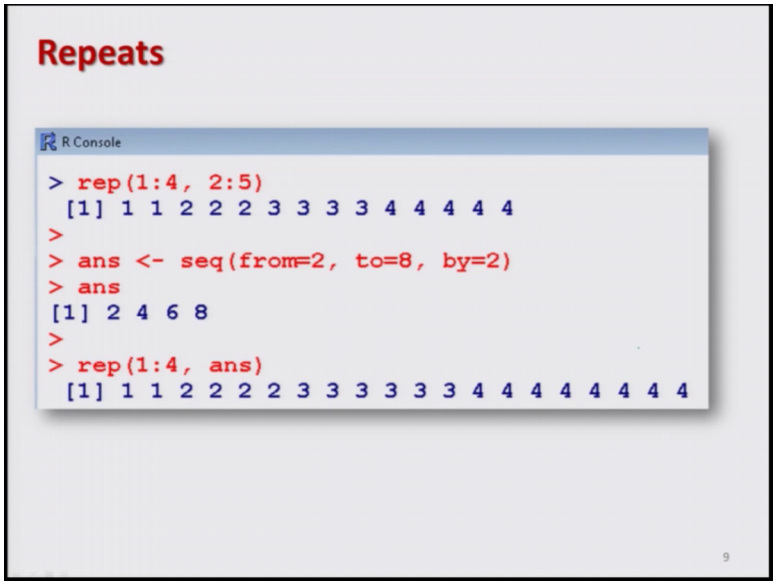

That means 4 has to be repeated 8 times and this entire sequence of values is obtained here that you can see right and here is the screenshot of the same thing; I would request you to please try it yourself; use different types of values try to make some experiment

and see what do you obtain now in the next step, I try to take another example from matrix and use the repeat command over the matrix.

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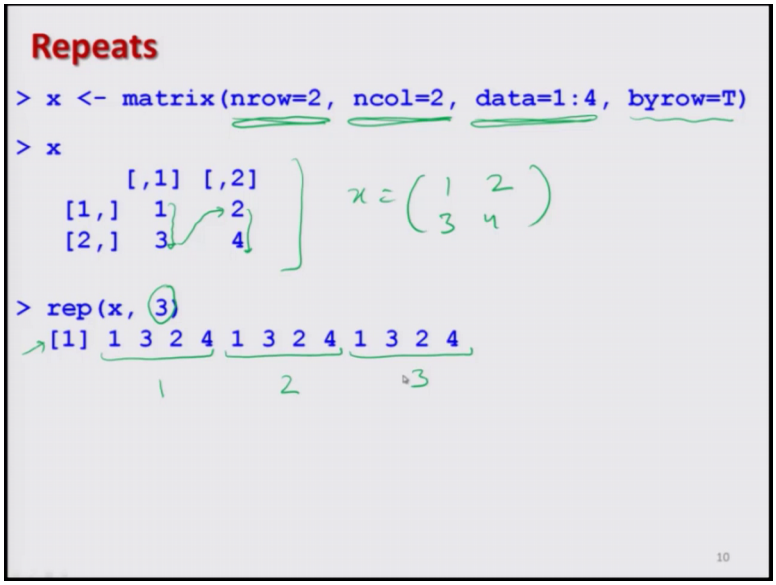

So, first of all I try to generate here a matrix having 2 number of rows, 2 number of columns and the data is here from 1 to 4 and this arrangement has to be with respect to row that mean data has to be arranged row wise now you understand we already have done the matrix command some time back. So, this will give us a value here x something like this; this is my here x matrix which is something like here 1, 2, 3 and here 4.

But now you see what happens when you try to repeat this matrix say for example, 3 times you can see here when you try to operate it; it gives you this type of outcome this is 1, 3, 2, 4, 1, 3, 2, 4, 1, 3, 2, 4 and what is here 1, 3, 2, 4, if you try to see the command comes over here; from here it goes to here and then from here it comes to here that is the sequence which is being followed.

So, whenever you are trying to use this repeat command with the matrix do not expect that the entire matrix is being going to be replicated or repeated, but something else happens and what happens that is what you have to understand that the sequence of 1, 3, 2, 4 is repeated 1 times 2 times and 3 times. So, in case if you need this type of data object conversion that will also help you and the advantage here is that that here the values may be anything actually, right. So, if you try to see here this is the output right and try to see this output also here.

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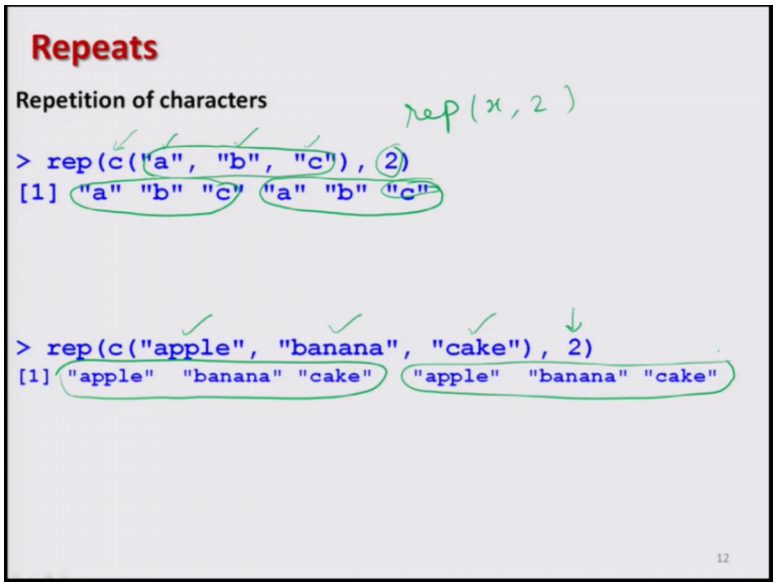

So, that you can get more confidence; so, first I try to generate here the matrix, you can see here; this is my here matrix here and then I try to here use this command and you can see here what are you getting, right. So, this will give us a more understanding that what happens when you are trying to play with matrix command and here is the screen output now let us try to take another example of repeat command when we are trying to deal with characters; characters means these are not numbers.

For example, if I have suppose 3 characters a, b and c, 3 alphabets here a, b and c and they are combined in a vector with the c command. So, what is happening here this is the same thing that rep x and c had times 2 times and I want this entire character to be repeated for example, say 2 times. So, you can see here the outcome comes out to be the same sequence what is here a, b and c; this is repeated here one time and then here 2 times, right; the only thing is this when you are trying to deal with this characters you have to give all these values inside this double quotes and in say another example if I try to say 3 character values say apple banana and cake and I want this to be repeated 2 times; then you can see here as soon as you press a enter you get here the first sequence here they say apple banana cake and the second sequence here apple banana cake.

Let us try to do this thing over the R console also; let us try to do this thing and you see here and suppose if you want to repeat here 5 times you can see here this is 5 times if you want to repeat here see here 20 times, you can see here this is the 20 times, right and

in the next slide, I am trying to give its output over here. In this example, I would like to stop here and I believe that I have given you a fair idea about the rep command, but as earlier; I would request all of you to just practice this rep command try to generate different types of data sets yourself depending on you need and requirement and you will see some other aspects in the next lecture. Till then good bye.